Name.....Index No .....

233/2

Candidate's signature.....

Date.....

PRE-MOCK
MARCH - APRIL

Kenya Certificate of Secondary Education

CHEMISTRY
Paper 2 (THEORY)
2 hours

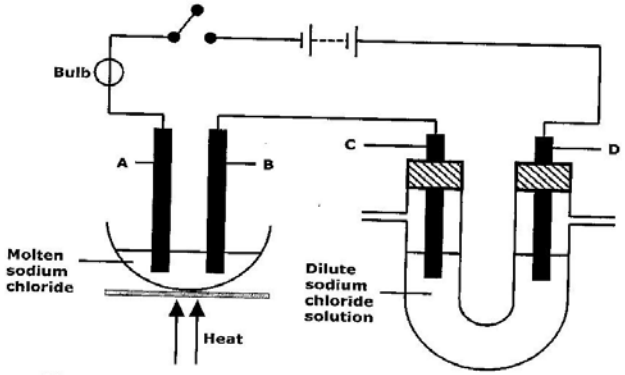
Instructions to Candidates

(a) Write your name class and index number in the spaces provided above
(b) Sign and write the date of the examination in the spaces provided above
(c) Answer ALL questions in the spaces provided.
(d) Mathematical tables and electronic calculators may be used.
(e) All working must be shown clearly where necessary.
(f) This paper consists of 12 printed pages
(g) Candidates should check the question paper to ascertain that all the pages are printed as indicated and no questions are missing

For examiner's use only

Questions	Maximum score	Candidates score
1	12	
2	11	
3	11	
4	10	
5	13	
6	12	
7	11	
Total	**80**	

1 (a) The apparatus below was used to investigate electrolysis of sodium chloride, NaCl. The crucible contained molten sodium chloride. The U-tube contained aqueous sodium chloride. The bulb lit when the switch was closed.



(i) By use of letters name the anodes and the cathodes. (2 marks)

Anode.....

Cathode .....

(ii) Why is heating necessary in the above experiment? (1mark)

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(iii) Write half cell equations at electrodes A and C. (2 marks)

Electrode A.....

Electrode C.....

(b) The same experiment was repeated but this time brine was used instead of aqueous sodium chloride.
(i) State and explain the observation that would be made in the U-tube. (2 marks)

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(ii). If the experiment is allowed to continue for a longer period of time comment on whether there would be any changes in the observations made in (b) (i) above. Explain your answer. (3 marks)

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(iii) Comment on changes in the pH of the brine at the end of the experiment. (2 marks)

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2. In an experiment to determine the molar enthalpy of displacement of copper; 1.0g of zinc powder was added to 50.0cm^3 of 0.2M copper (II) sulphate solution and the mixture stirred gently. The temperature of the mixture rose from 20.0°C to 27.0°C.

(a) Explain why polystyrene cup was used instead of a glass beaker. (1mark)

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(b) Write a chemical equation for the above reaction. (1mark)

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(c) Calculate the number of moles of copper (II) sulphate in the solution. (1mark)

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(d) Calculate the molar heat of displacement of copper. (SHC of solution = 4.2kJkg^{-1}K^{-1}; density of solution = 1gcm^{-3}) (3 marks)

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(e) Why is the molar heat of displacement obtained above lower than the actual value? (1mark)

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(f) Draw an energy level diagram for the reaction above. (2 marks)

(g) If calcium is used in place of zinc, compare the ΔH value with that of zinc. Give a reason. (2 marks)

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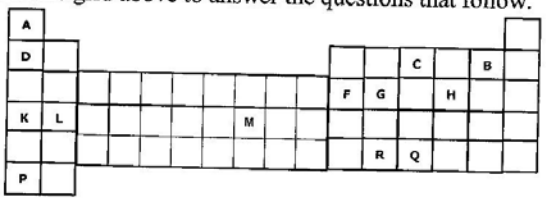
3. Use the information in the grid above to answer the questions that follow.



(a) Select an element that can form an ion with a charge of -2. Explain. (2 marks)

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(b) Giving reasons select:

(i) the metallic element with the lowest melting point. (1mark)

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(ii) the non-metallic element with the highest melting point. (1mark)

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(iii) write down the formula of the chloride of R. (1mark)

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(c) Give the formula of the oxide of P. (1mark)

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(d) Explain the following observations:

(i) L is a hard solid with higher melting point than K. (1mark)

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(ii) The hydride of C is more volatile than the hydride of D. (1mark)

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(iii) The fourth ionization energy of F is much greater than the fourth ionization energy of C. (1mark)

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(d) Sulphur (IV) oxide is used in the Contact process to make sulphuric (VI) acid. Describe the conditions and name the catalyst in the Contact process. (2 marks)

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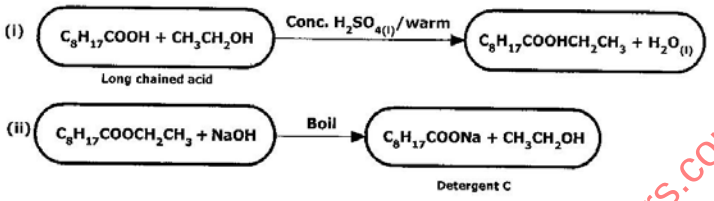
5 (a) Below are **two** reactions showing how a long-chained carboxylic acid can be converted to detergent C.



(i) Name each of the types of reactions (i) and (ii). (2 marks)

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(ii) State **one** disadvantage of using detergent C in washing clothes. (1mark)

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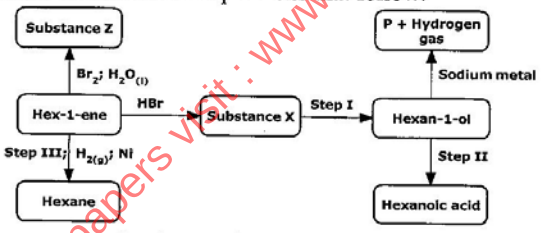
(b) Study the scheme below and answer the questions that follow.



(i) What substances are necessary for the reactions in each of the steps marked I and III. (3 marks)

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(ii) Name each of the compounds labeled X and Z. (2 marks)

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(iii) Write an equation leading to the formation of P. (1mark)

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(iv) Describe the chemical test that can be used to distinguish $CH_3CH_2CH_2CH_2OH$ and $CH_3CH_2CH_2COOH$. (2 marks)

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(v) Give **one** advantage and disadvantage of using leaded petrol in motor vehicles. (2 marks)

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6 I. Sulphur production in the USA is about ten million tonnes per year. 90% of this sulphur is used to make sulphuric (VI) acid.

(a) Sulphur (IV) oxide is made by burning sulphur in air. Most of it is used in the Contact Process. Give one other use of this gas. (1mark)

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(c) In the Contact Process, sulphur (IV) oxide is made by spraying molten sulphur into air.

(i) Suggest why the molten sulphur (IV) oxide is made by spraying molten sulphur into air. (1mark)

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(ii) Describe how sulphur (IV) oxide is changed into sulphur (VI) oxide. (2 marks)

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(iii) By means of equations show the formation of sulphuric (VI) acid from sulphur (VI) oxide. (2 marks)

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(d) Over 50% of the sulphuric acid is used to make fertilizers such as the nitrogen-based fertilizer ammonium sulphate. Give **one** other use of sulphuric acid. (1mark)

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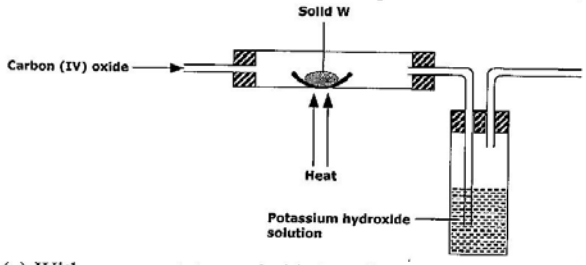
II. The diagram below shows how carbon (II) oxide gas can be prepared starting with carbon (IV) oxide and solid W. Study it and answer the questions that follow.



(a) With reasons state a suitable location where such an experiment should be rightly conducted. (1mark)

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(b) What is the purpose of concentrated potassium hydroxide? (1mark)

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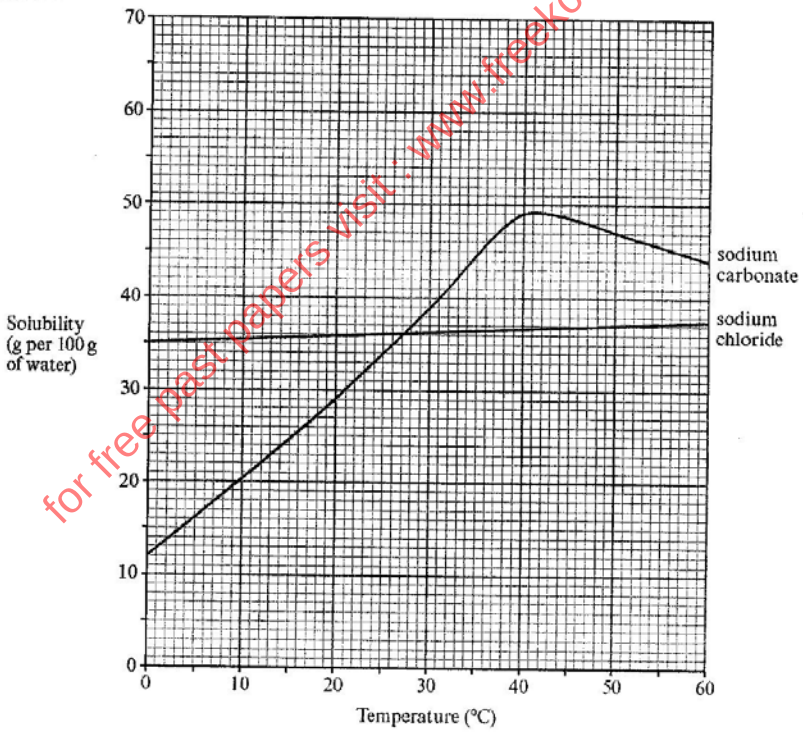
(c) Identify solid **W**..... (1mark)

(d) Complete the diagram to show how dry carbon (II) oxide can be collected. (2 marks)

7. The graphs below show the solubilities of sodium chloride and sodium carbonate in water at different temperatures.



(a) Describe the trend in the solubility of sodium carbonate. (1mark)

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(b) The table below shows the solubility of sodium bromate in water at different temperatures.

Temperature (°C)	0	10	20	30	40	50	60
Solubility (g per 100g of water)	25	29	35	41	48	55	64

Plot the results from the table on the grid last page and draw a suitable line. (3 marks)

(c) List the three sodium compounds in order of decreasing solubility at 40 °C. (1mark)

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(d) The solubility of silver chloride is 0.0002 g in 100 g of water at room temperature, 20 °C.
You are given a mixture of sodium chloride and silver chloride powder. Describe how you would obtain a sample of silver chloride from the mixture. (3 marks)

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II. A group of students carry out an experiment to investigate the relative hardness of four samples of water, **A**, **B**, **C** and **D**.
The students add soap solution, 0.5 cm^3 at a time, to sample **A**. The mixture is shaken after each addition. The volume of soap solution needed to produce 1 cm of lather is recorded. They test samples **B**, **C** and **D** in exactly the same way. They then repeat the experiment after boiling each sample of water. The results obtained are shown in the table below.

Water sample	Volume of soap solution needed (cm^3)	
	Before boiling	After boiling
A	10.5	10.5
B	1.5	1.5
C	6.0	1.5
D	9.5	7.0

(a) State which water sample is the hardest and give a reason for your answer. (1mark)

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(b) State which water sample contains both permanent and temporary hard water and give a reason for your answer. (2 marks)

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